A multidisciplinary investigation into "playing-up" in academy football according to age phase

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In an attempt to facilitate more appropriate levels of challenge, a common practice in academy football is to *play-up* talented youth players with chronologically older peers. However, the context of playing-up in academy football is yet to be empirically explored. Thus, the purpose of this study was to examine the multidimensional factors that differentiated players who play-up from those who do not. Ninety-eight participants from a single football academy were examined within their age phase: Foundation Development Phase (FDP; under-9 to under-11; *n*=40) and Youth Development Phase (YDP; under-12 to under-16; *n*=58). Drawing upon the FA Four Corner Model, 27 factors relating to *Technical/Tactical*, *Physical*, *Psychological*, and *Social* development were assessed. Following MANOVA analysis within both the FDP and YDP, significant differences were observed for *Technical/Tactical* and *Social* sub-components (P<0.05). Further differences were observed for *Physical* and *Psychological* sub-components (P<0.05) within the YDP. In sum, *Technical/Tactical* and *Social* characteristics appeared to differentiate those who play-up compared to those who do not within the FDP. In the YDP however, there were measures representing all sub-components from the FA Four Corner Model. Subsequently, it is suggested coaches and practitioners consider these holistic factors when playing-up youth football players within relevant age-phases.

Keywords: Accelerated learning; Elite youth football; Expertise; Talent identification; Talent development; Relative age effect

Introduction

A key challenge for sport organisations relates to creating appropriate developmental settings for athletes (Côté, Turnnidge, & Evans, 2014). Indeed, understanding how to effectively meet the needs of athletes with a varying range of experience, ability, and motivation is a perpetual struggle for sport practitioners (Côté, Bruner, Erickson, Strachan, & Fraser-Thomas, 2010). In general, the typical method for grouping athletes is by chronological age. However, within these age-bands, there may be large discrepancies in athletes' physical and psychosocial development (Wattie & Baker, 2018). For high-achieving athletes, there is often pressure from stakeholders (e.g., organisations, coaches, and parents) to search for more appropriate levels of challenge and competition (Collins & MacNamara, 2017; Taylor & Collins, 2019). One common solution to this issue is for athletes to train and compete with older peers; this practice is commonly known as *playing-up* (Malina et al., 2019). Anecdotal evidence suggests that athletes who play-up may be exposed to higher intensities of practice and competition, which could have important implications on their developmental outcomes (e.g., Malina, 2010; O'Sullivan, 2017; U.S. Soccer, 2011; Wiersma, 2000). However, no studies to date have explored playing-up a chronological age group and its connections to athletes' outcomes.

If playing-up is thought of as a way to group athletes based on skill, there is a growing body of research on how other forms of athlete grouping may affect development. Current literature in sport has mainly explored the effects of grouping athletes based on chronological age and size. With regards to chronological age, concerns have been raised due to relative age effects (RAEs) that favours older athletes in a respective age group (Barnsley, Thompson, & Barnsley, 1985). For instance, when sport programmes create age groups using an annual calendar year, athletes born just after the cut-off date are older than most of their peers (Musch & Grondin, 2001). As such, these athletes are often bigger and stronger than those born later in the selection year, and fortuitously size and strength are often mistaken or misconstrued as implications of *talent* (Baker, Schorer, & Wattie, 2018; Baxter-Jones, 1995; Cobley, Baker, Wattie, & McKenna, 2009). To be specific, if the oldest athletes are chosen for a competitive team because of their age or physical qualities, they may gain access to quality coaching, competition, and facilities, which could allow them to become better players (e.g., Furley & Memmert, 2016; Sherar, Baxter-Jones, Faulkner, & Russell, 2007; Wattie, Cobley, & Baker, 2008). Conversely, studies have shown detrimental effects for relatively younger athletes, including limited selection opportunities and higher rates of dropout (e.g., Delorme, Chalabaev, & Raspaud, 2011; Hancock, Ste-Marie, & Young, 2013; Helsen, Starkes, & Van Winckel, 1998). It is also important to consider that RAEs also go "beyond the physical", whereby age related differences in experience, cognitive, and social development can exacerbate relative age advantages (Doncaster, Medina, Drobnic, Gómez-Díaz, & Unnithan, 2020). Together, these findings indicate that when youth athletes are grouped based on fixed chronological age, there are important implications for athlete development.

Further to the bias of an earlier birthdate through RAEs, differences in growth and maturation status within a single age group can also be considerable (Pearson, Naughton, & Torode, 2006). Indeed, it is important to recognise that RAEs and maturation are independent constructs (Cumming, Searle, et al., 2018). For instance, within an under-13 chronological age group, it is possible to have two players with the same relative age but as much as five years difference in biological age (Gouvea et al., 2016; Malina, Rogol, Cumming, Coelho-e-Silva, & Figueiredo, 2015). Thus, individual increases in physical performance, such as speed, power, agility, and endurance, will also occur at different chronological ages (Lloyd & Oliver, 2012). Therefore, a player's earlier growth and maturity status, relative to their later-maturing but same-aged peers, may possess advantages in both physiological and physical performance measures (Meylan, Cronin, Oliver, & Hughes, 2010). As a result, this often leads to systematic selection and progression of more mature players compared to less mature counterparts, who may be regarded as less *talented* during the player selection process, or dropout due to low confidence or lack of success (Figueiredo, Goncalves, Coelho-e-Silva, & Malina, 2009).

Drawing upon an education context, in the same way that coaches can play-up *talented* youth athletes to expose them to a greater intensity of practice and competition, teachers can move high-achieving students into advanced streams of study; providing them with learning opportunities that are more appropriately challenging (e.g., Kulik, 2004; Neihart, 2007; Tieso, 2005; Vygotsky, 1978). For example, *acceleration* (i.e., when students enter school early or skip a grade) is a strategy that is comparable to playing-up. Previous research on the impact of acceleration on youth's academic achievement has often supported its implementation (Steenbergen-Hu, Makel, & Olszewski-Kubilius, 2016). Meta-analytic data from Kulik and Kulik (1982) and Steenbergen-Hu and Moon (2011) found that high-achieving students who were accelerated showed greater academic performance than their non-accelerated equivalents, whilst also matching similar academic attainment to that of their older peers. This evidence suggests the movement of youth into advanced learning environments may be associated with positive performance outcomes for high-achieving individuals. However, without advanced knowledge regarding *how* and *why* acceleration in school and sport may affect academic achievement and sport-specific development, practitioners will struggle to optimise programming for high-achieving students and athletes alike. Therefore, in the context of playing-up, it is necessary to examine the factors that influence the sport-specific development of those particular athletes.

To improve this understanding, recent research has developed tools to assess multiple aspects of athlete development (e.g., Kelly, Wilson, & Williams, 2018). More specifically in football, there has been a growing body of multidisciplinary athlete development research in recent years, with evidence showcasing how certain factors are associated with greater development towards attaining expertise (see Sarmento, Anguera, Pereira, & Araujo, 2018). For example, Forsman, Blomqvist, Davids, Liukkonen, and Konttinen (2016), Huijgen, Elferink-Gemser, Lemmink, and Visscher (2014), and Zuber, Zibung, and Conzelmann (2016) all applied a battery of holistic tools to measure athlete development in youth football. They all revealed that highly skilled players scored above average on all physiological, psychological, tactical, and technical factors compared to their lower skilled peers, as well as being more likely to advance to the highest level of performance. This highlights the importance of providing a multidisciplinary research methodology in youth football for athlete development (Collins & MacNamara, 2017; Williams & Drust, 2012).

Multidisciplinary philosophies are evident through applied frameworks such as the FA Four Corner Model (The Football Association, 2019). This model, which is often adopted in professional football clubs and organisations, advocates the assessment and development of players according to: (a) *Technical/Tactical*, (b) *Physical*, (c) *Psychological*, and (d) *Social* attributes (The Football Association, 2014). Previous observational investigation from Towlson, Cope, Perry, Court, and Levett (2019) has demonstrated the usefulness of applying the FA Four Corner Model to holistic research in academy football. This study also reinforces the importance of encompassing an age phase-specific approach to applied athlete development literature. Additionally, by using this model to facilitate a greater knowledge translation between theory and practice, it provides a salient framework for understanding the factors associated with playing-up since it is a tool that is perceived to be relevant and useful for sport practitioners.

Therefore, the purpose of this study was to examine the multidimensional factors that differentiated players who play-up a chronological age group, compared to those who do not, within an English football academy according to age phase (FDP and YDP). It was hypothesised that characteristics across the FA Four Corner Model would positively differentiate between those players who play-up and those who do not within both age phases.

Methods

Sample

Following institutional ethical approval and informed consent, ninety-eight male participants were examined within their specific age phase: FDP (under-9 to under-11; n = 40; M_{age} 10.6 ± 0.9 years) and YDP (under-12 to under-16; n = 58; M_{age} 14.4 ± 1.3 years). All the participants were recruited from the same Tier 4 English professional football club and their Category 3 academy. Players were considered to play-up a chronological age group when they participated in ≥ 50% of their combined training and match-play time, throughout the entire season, within an older age group in the FDP (n = 15 play-up; n = 25 non-play-up) and YDP (n = 13 play-up; n = 45 non-play-up). Previous playing-up experience was also recorded for the playing-up groups across the two age phases: (a) FDP play-up experience ranged from 1–4 years ($M_{play\text{-}up}$ = 2 ± 0.9 years); and, (b) YDP play-up experience ranged from 2–8 years ($M_{play\text{-}up}$ = 4.6 ± 2.4 years). The average weekly training and match-play time was also recorded for both age phases: (a) FDP = 9–10.5 training hours/week and one match-play hour/week; and, (b) YDP = 10–14.5 training hours/week and one match-play hour/week. Goalkeepers were not included in this study due to their contrasting position-specific requirements (Gil et al., 2014). Institutional ethical approval was granted for this study.

Measures

Seven data collection methods were measured across an entire football season. For the purpose of this research, these measures were then allocated into sub-components, in-line with the FA Four Corner Model: (1) *Technical/Tactical*; (a) technical tests, (b) match analysis statistics, and (c) perceptual-cognitive expertise (PCE) video simulation tests. (2) *Physical*; (a) anthropometric measures, and (b) fitness tests. (3) *Psychological*; (a) the Psychological Characteristics for Developing Excellence Questionnaire (PCDEQ). And, (4) *Social*; Participation History Questionnaire (PHQ). The citation(s) aligned to each measure(s) below represents the instrument and protocol used for the factors in this current study.

A combined total of 27 factors were cumulated from the seven measures: (1) Four football-specific technical tests; (a) ball juggling, (b) slalom dribble, (c) shooting accuracy, and (d) lob pass (see Vaeyens et al., 2006). (2) Four match analysis statistics from across an entire season; (a) reliability in possession, (b) pass completion, (c) dribble completion, and (d) total touches (see Kelly, Wilson, Jackson, & Williams, 2020). (3) Two PCE video simulation tests; (a) 'pre' execution occlusion, and (b) 'at' execution occlusion (see Belling, Suss, & Ward, 2014). (4) All six factors from the 59-item PCDEQ; (a) Factor 1 – support for long term success, (b) Factor 2 – imagery use during practice and competition, (c) Factor 3 – coping with performance and developmental pressures, (d) Factor 4 – ability to organise and engage in quality, (e) Factor 5 – evaluating performances and working on weaknesses, and (f) Factor 6 – support from others to compete to my potential (see MacNamara & Collins, 2011; 2013). (5) Six items from the PHQ; (a) age started playing academy football, (b) total coach-led practice hours, (c) total peer-led play hours, (d) total football hours, (e) total multisport hours, and (f) total football and multisport hours (see Ford, Ward, Williams, & Hodges, 2009). (6) One anthropometric measure; (a) percentage of estimated adult height attained (see Khamis & Roche, 1994). And, (7) Four fitness tests; (a) 0–10 m sprint test, (b) 0–30 m sprint test, (c) L-agility test, and (d) countermovement jump (CMJ) test (see Kelly, Wilson, Jackson, Turnnidge, & Williams, 2020).

Data analysis

Descriptive statistics were calculated for each variable using *z*-scores to account for differences between chronological ages in each age phase, as well as confirming with data normality. Four separate hypotheses were tested to examine the differences between playing-up and non-playing-up groups, within each age phase, corresponding to the FA Four Corner Model. Initial analysis investigated differences between playing-up and non-playing-up groups' mean scores within both age phases using a two-way multivariate analysis of variance (MANOVA). Further analysis used an independent samples *t*-test to compare playing-up and non-playing-up groups' mean scores within both age phases, with a Bonferroni correction applied to prevent alpha inflation. Cohen's *d* effect size was used to examine the magnitude of difference between those who play-up and those who do not, with d = 0.2, 0.5, and 0.8 marking small, medium, and large effect sizes, respectively. A binary logistic regression was also used to model playing-up and non-playing-up status within both age phases, comprising of univariate analysis from the variables within each of the four sub-components. Further multivariate logistic regression analysis was conducted for both the FDP and YDP, with variables included when significant or nearing significance ($P < 0.100$) in the univariate analyses which accumulated all the four corners. The multivariate model employed a backward stepwise elimination of variables. Differences were considered statistically significant at $P < 0.05$.

Results

MANOVA of between group differences

The MANOVA for the *Technical/Tactical* sub-component showed a significant between group difference within both the FDP, F(10,29) = 6.044, $P < 0.001$ with Pillais' Trace = 0.676, and the YDP, F(10,46) = 2.088, $P = 0.045$ with Pillais' Trace = 0.312. The

MANOVA for the *Physical* sub-component showed no significant between group difference within the FDP, F(5,34) = 2.968, *P* = 0.096 with Pillais' Trace = 0.232. However, there was a significant between group difference for the *Physical* sub-component within the YDP, F(5,51) = 3.766, *P* = 0.006 with Pillais' Trace = 0.270. The MANOVA for the *Psychological* sub-component showed no significant between group difference within the FDP, F(6,33) = 0.583, *P* = 0.741 with Pillais' Trace = 0.096. However, there was a significant between group difference for the *Psychological* sub-component within the YDP, F(6,50) = 4.160, *P* = 0.002 with Pillais' Trace = 0.333. The MANOVA for the *Social* sub-component showed a significant between group difference within both the FDP, F(6,33) = 2.560, *P* = 0.038 with Pillais' Trace = 0.318, and the YDP, F(6,50) = 2.493, *P* = 0.035 with Pillais' Trace = 0.230.

Technical/Tactical

Within the FDP, there was a significant difference between the playing-up and non-playing-up groups, with the playing-up group recording a greater pass completion, lob pass, and PCE 'pre'. Within the YDP, there was a significant difference between the playing-up and non-playing-up groups, with the playing-up group recording greater total touches. A Bonferroni correction was applied, with results considered significant at $P < 0.005$ (see Table 1).

****Table 1 near here****

Physical

Within the FDP, there were no significant differences between the playing-up and non-playing-up groups. Within the YDP, there was a significant difference between the playing-up and non-playing-up groups, with the playing-up group recording greater percentage of estimated adult height attained and CMJ height, as well as quicker 0–10 m and 0–30 m sprint times. A Bonferroni correction was applied, with results considered significant at $P < 0.01$

(see Table 2).

****Table 2 near here****

Psychological

Within the FDP and YDP, there were no significant differences between the playing-up and non-playing-up groups. A Bonferroni correction was applied, with results considered significant at $P < 0.008$ (see Table 3).

****Table 3 near here****

Social

Within the FDP, there was a significant difference between the playing-up and non-playing-up groups, with the playing-up group recording greater total football and multisport hours. Within the YDP, there was a significant difference between the playing-up and non-playing-up groups, with the playing-up group recording greater total coach-led practice hours. A Bonferroni correction was applied, with results considered significant at $P < 0.008$ (see Table 4).

****Table 4 near here****

Multivariate analysis

Within the FDP, the multivariate logistic regression across the four corners showed a significant association with playing-up ($\chi^2(4) = 38.486$, $P < 0.001$), with the lob pass and PCE 'pre' significant predictors within the model and accounted for 61.8% of variance observed. Within the YDP, the multivariate logistic regression across the four corners showed a significant association with playing up ($\chi^2(4) = 39.610$, $P < 0.001$), with ball juggle, 0–10 m sprint, PCDEQ Factor 3, PCDEQ Factor 6, and total coach-led practice hours significant predictors within the model and accounted for 49.5% of variance observed (see Table 5).

****Table 5 near here****

Discussion

Through adopting a holistic practical framework, the primary aim of this study was to examine the characteristics that discriminated academy football players who played-up a chronological age group compared to those who did not. By employing the FA Four Corner Model, it was found that the majority of the significant factors associated with playing-up within the FDP were *Technical/Tactical* and *Social* in nature. In comparison, results within the YDP revealed measures representing a broader multidisciplinary perspective. The wider range of differences observed within in the YDP group may be due to the fact that these older players benefited from more years of playing-up and accumulated more training. As such, the implications of these findings provide an impetus for coaches and practitioners to reflect upon when considering playing youth football players up a chronological age group according to age phase.

Technical features, including greater reliability in possession and pass completion, have been associated with superior performance outcomes at senior professional level (e.g., Gomez, Mitrotasios, Armatas, & Lago-Penas, 2018; Liu, Hopkins, & Gomez, 2016; Rampinini, Impellizzeri, Castagna, Couus, & Wisloff, 2009; Yang, Leicht, Lago, Gomez, 2018). Athlete development literature in youth football has also cited technical abilities as distinct predictors of greater developmental outcomes (Figueiredo, Coelho-e-Silva, & Malina, 2011; Figueiredo et al., 2009). In this current study, *Technical/Tactical* factors appeared to be discriminant functions for playing-up amongst both age phases. However, there were no common themes between the age phases regarding specific *Technical/Tactical* characteristics. There appears to be an association between a greater ball maintenance and executing accurate actions with playing-up in the FDP (i.e., reliability in possession, pass completion, shooting accuracy, and lob pass). Whereas, in the YDP, more creative skills appeared to be associated with playing-up (i.e., dribble completion, total touches, slalom dribble, and ball juggling). Thus, the complex nature of the *age-specific* developmental process coupled with the *technique-specific* demands of the modern game are important considerations in the playing-up decision-making process for coaches and practitioners.

There are a number of potential reasons why *Technical/Tactical* factors differentiated those who play-up compared to those who do not. First, since coaches are often the decision-makers in the playing-up process and have a greater understanding of *Technical/Tactical* features compared to the other sub-components (Lefebvre, Evans, Turnnidge, Gainforth, & Côté, 2016); greater value may be placed on these characteristics compared to the others. Indeed, the term “if you are good enough, you are old enough” is commonly used to make reference towards technical ability driving the decision for a player to compete in an older age group, thus placing an important emphasis on creating a developmentally appropriate environment beyond chronological age grouping. Furthermore, from a positive youth development perspective, traditional coach education and sport-specific qualifications often focus on athlete competence compared to other developmental factors (e.g., confidence, connection, and character; Côté et al., 2010; Fraser-Thomas et al., 2005; Lefebvre et al., 2016). Thus, whilst more evidence is required, it is suggested coaches and organisations involve key stakeholders (e.g., Sport Scientists, Sport Psychologists, Strength and Conditioning Coaches) as part of a broader, multidimensional decision-making strategy when considering to play a young athlete up an age group (Piggott, Müller, Chivers, Papaluca, & Hoyne, 2019).

It is well acknowledged that the observation of physical characteristics is an important part of the talent identification and development processes in youth football (Kelly &

Williams, 2020). In the context of playing-up, this current study revealed the 0–30 m sprint test was a key discriminator in both age phases, suggesting that it is an efficient physical test. It is also worth recognising previous football development literature has acknowledged sprint ability as a contributing factor towards an increased likelihood of recruitment (Carling, Le Gall, & Malina, 2012), greater developmental outcomes (Buchheit & Mendez-Villanueva, 2014; Gonaus & Müller, 2012), and attaining senior professional status (Le Gall, Carling, Williams, & Reilly, 2010). Findings within the YDP also exemplify how further fitness testing factors (i.e., 0–10 m sprint test and CMJ), alongside enhanced maturity status (greater percentage of estimated adult height attained), contributed to playing-up. Perhaps this can be recognised as a positive outcome, whereby coaches and practitioners are (consciously or unconsciously) identifying enhanced physical performance and maturity status in certain players, and thus offering them the opportunity to play-up to counteract or moderate their physical presence within their respective chronological age group (Baxter-Jones, 1995). Conversely, if coaches and practitioners are mistaking athletes' maturity for their ability, this may negatively affect the long-term developmental outcomes of late maturing athletes; who might miss the opportunity for more appropriate levels of competition and coaching through playing-up (Cobley et al., 2009). Due to the quantitative nature of this current study, one difficulty is being unable to directly identify how much a decision of playing-up is based on a *reward* for outperforming age group peers, and how much a decision is based on providing *sufficient challenge*. Therefore, further research is needed to understand coaches and practitioners' rationale for selecting youth athletes to play-up, and how this may influence their development through playing-up.

To mitigate growth and maturation advantages that encompass chronological age grouping, bio-banding (i.e., grouping athletes based on biological age) has been introduced in team sports (Bradley et al., 2019; Cumming, Lloyd, Oliver, Eisenmann, & Malina, 2017).

Proponents of bio-banding suggest that it may help to reduce inequality in competition that occurs due to growth and maturation differences between same-aged athletes (Malina et al., 2015). Specifically, when athletes with larger body types compete against each other, they have been shown to rely less on their size and more on their skill to succeed (Cumming, Brown, et al., 2018). At the same time, when athletes with smaller body types compete against each other, they may be exposed to more manageable levels of challenge (Bradley et al., 2019; Malina et al., 2015). Thus, when applied to the context of playing-up, for those with advanced maturity status and physical performance characteristics in the YDP, playing-up may also be a useful tool to moderate these *Physical* advantages. Furthermore, it is necessary to critique current knowledge regarding the needs of youth athletes who compete above their age level, and the differentiating factors that allow these athletes to succeed under challenging circumstances.

Although birth quarter was not included in the initial data analysis, it was found that 14 out of the 15 players who played-up in the FDP were born in the first half of the year. Additionally, nine out of 13 of the players who played-up in the YDP were born in the first half of the year. As a result, the overrepresentation of early birth quartiles who play-up should not be ignored. As such, it may be suggested playing-up can impact upon chronological age group development twofold: (a) playing-up may moderate the RAE by presenting a new cohort of later birth quartiles. This proposal would enable players who play-up to become the youngest in the older age group they move into. And, (b) playing-up may create an *underdog effect* (e.g., Gibbs, Jarvis, & Dufur, 2012) for chronologically older players. This psychologically based explanation suggests playing-up may facilitate long-term developmental outcomes by necessitating players to overcome the odds of the RAE through being challenged by older and more advanced peers (Kelly et al., 2020).

Over the last two decades there has been a substantial growth in research directly related to sport psychology and youth football (Gledhill, Harwood, & Forsdyke, 2017). *Psychological* factors in this current study revealed the PCDEQ Factor 6 (support from others to compete to my potential) was greater in those who played-up in the YDP. Perhaps this is a result of playing-up being recognised as a reward from coaches or practitioners for expert age group *performance* (resulting in greater perceived support; Ginsburg, 2014; O'Sullivan, 2017); as opposed to acknowledging it as a tool to facilitate *development*. Alongside the importance of the coach-athlete relationship, previous research has demonstrated the particular importance of support from parents to facilitate long-term player development in football. For instance, Kavussanu, White, Jowett, and England (2011) found elite-level football players often have parents who create an environment of appreciation of success through hard work and learning. Consequently, this may support the athlete development process in youth football through player-level task-oriented and self-determined motivation, which is associated with a supportive parenting environment (Ullrich-French & Smith, 2009). Moreover, this may also develop a culture of unconditional self-acceptance and an increased self-awareness in youth football players, which could be required whilst fluctuating between chronological age groups (Hill, Hall, Appleton, & Kozub, 2008).

It is also important to reflect upon the potential psychological considerations of moving players up an age group, such as: (a) recognise they are being taken away from their chronological age group friends (Bradley et al., 2019). (b) Appreciate they are changing their age group coach and realise that their individual needs may change (Renshaw, Oldham, & Bawden, 2012). (c) Psychological and behavioural support should be offered to help them compete against older players (e.g., Vygotsky, 1978). And, (d) ensure they (and their parents) are being supported during this transition (Harwood, Drew, & Knight, 2016). Thus, this process must be carefully considered by all key stakeholders (e.g., coaches, practitioners, players, and parents) to protect the individual's psychological well-being. Indeed, in the context of playing-up, Vygotsky (1978) suggests that the role of a coach is to skilfully facilitate a child's development by sharing knowledge, as well as controlling those elements of a task that are initially beyond the player's capabilities. Overall, contrary to Towlson et al. (2019) who highlighted that practitioners placed significantly greater perceived importance on psychological factors compared to the other three sub-components, this current research suggests it may be more beneficial to focus on psychology as one aspect as part of a holistic approach to athlete development. Nevertheless, further qualitative research is required to understand the personal experiences of athletes who play-up, as well as the decision-making processes of their coaches.

Various concepts, such as early specialisation, early diversification, and early engagement, have attempted to align activities to developmental pathways for youth athletes', in order to maximise their potential to achieve senior expertise (e.g., Côté, Baker, & Abernethy, 2007; Côté, Turnnidge, & Vierimaa, 2016; Ericsson, Krampe, & Tesch-Roemer, 1993; Ford & Williams, 2017; Ford et al., 2009). In football specifically, existing research appears mixed, in that each of the activity types are associated with development and performance outcomes in some but not in others. For instance, sport-specific peer-led play and coach-led practice in football is typically associated with performance at both youth and senior level (Hendry & Hodges, 2018; Hendry, Williams, & Hodges, 2018; Roca, Williams, & Ford, 2012). In contrast, engagement in multisport activities during childhood and adolescence appeared to be the biggest performance discriminator for greater senior age performance (Güllich, 2019; Güllich, Kovar, Zart, & Reimann, 2016; Hornig, Aust, & Güllich, 2016). This current study proposes it is not necessarily the type of activity, but more specifically the quantity of engagement through a diverse range of activities that contributes to playing-up. In the FDP for instance, total football and multisport hours was the only *Social* factor associated with playing-up. In comparison, total coach-led practice hours *and* total peer-led play hours were associated with playing-up in the YDP.

From a psychosocial perspective, engaging in more activity as a whole may demonstrate an increased self-determined motivation to achieve expertise (Hendry, Crocker, Williams, & Hodges, 2019) or a greater vested interest in football activity (Memmert, Baker, & Bertsch, 2010). It may also be suggested that engaging in a greater amount of coach-led practice, peer-led play, and multisport activity together are all contributing factors to superior development. Coaches and practitioners are encouraged to incorporate an array of activities within a football academy setting (e.g., multisport games, child-led sessions) to offer a broader range of development opportunities. Since the *Social* elements within this particular study only focussed on the environment that athletes develop through exploring their sport participation history (e.g., coach-led practice, peer-led play, individual practice, competition, multisport activities), it is also important to recognise the need for more broader social measures in athlete development literature in future playing-up research (e.g., social identity, Bruner & Benson, 2018; prosocial behaviour, Kavussanu & Boardley, 2009; moral disengagement, Boardley & Kavussanu, 2007). As such, these research methodologies may prove fruitful in guiding a social-specific component as part of a greater holistic approach.

Limitations and future directions

It is important to consider methodological limitations inherent with observational case studies, such as access to limited participants and issues with external validity (Morgan, Pullon, Macdonald, McKinlay, & Gray, 2017). To address these limitations, it is important to recognise the accessibility to a sample of professional football academy players that are often difficult to recruit, particularly for multidisciplinary observations. Thus, the methodological framework applied to this current study offers a holistic resource to reflect upon when considering playing young football players up a chronological age group according to age phase. Regarding the potential concern of applying these findings externally, the category status and geodemographic factors that distinguish academies must be considered. Thus, it is important to recognise this study recruited Category 3 academy players from the South West of England, and whether findings can be applied to higher-level category academies or other countries remains unclear.

Although playing-up has implications for performance and developmental outcomes in youth football, further qualitative research is required to investigate athlete perceptions and experiences of playing-up (e.g., Goldman, Turnnidge, Kelly, de Vos, & Côté, under review). Parents perceive playing-up as an opportunity for young players to attain positive performance outcomes (Ginsburg, 2014; O'Sullivan, 2017). However, these outcomes do not necessarily match with what youth may *want* to take away from their sport experiences (Wiersma, 2000). For example, findings from preliminary research indicates that youth athletes may not want to play-up if it prevents them from participating with same-aged friends (Campbell, Bracewell, Blackie, & Patel, 2018). Anecdotal evidence shows that athletes who play-up may perceive an increased risk of injury due to overtraining or aggressive play from opponents (Moir, 2013). Indeed, this may further existing knowledge concerning *Social* factors that were limited in this current study. In addition, further longitudinal studies are suggested to identify whether playing-up has long-term benefits towards developing expertise, through exploring transitions from youth level to professional status or by examining how playing-up may accelerate development. Finally, although perhaps applied less commonly, the factors that differentiate those who "play-down" a chronological age group should also be examined. Similarly, the psychosocial implications of playing-down may arguably differ to those who play-up, thus they should be considered as two independent contexts to facilitate an appropriate learning environment for young athletes.

Conclusion

Findings from this current study support the implementation of the FA Four Corner Model to facilitate a multidisciplinary approach in youth football player development. In the FDP, *Technical/Tactical* and *Social* characteristics appeared to differentiate those who play-up compared to those who do not. In the YDP however, there were significant measures representing all four sub-components. Subsequently, it is important that coaches and practitioners consider these holistic factors when deliberating playing youth footballers up a chronological age group within both age phases. Further, coaches and practitioners are encouraged to utilise playing-up as a strategy to facilitate greater individual *development*, rather than solely focussing on fixed chronological age grouping for elite *performance*.

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Disclosure statement

The authors declare that they have no conflict of interest.

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Table 3. *Psychological* variable descriptive statistics, independent *t*-test results, and univariate regression models.

Table 4. *Social* variable descriptive statistics, independent *t*-test results, and univariate regression models.

Table 5. Multivariate logistic regression across the four corners.

Table 1. *Technical/Tactical* variable descriptive statistics, independent *t*-test results, and univariate regression models.

Variable	Playing-up *z*-score	Non-playing-up *z*-score	*P*	*d*	Univariate regression
Ball juggling					
FDP	0.314 ± 1.113	-0.188 ± 0.849	0.115	0.507	$\chi^2(1) = 2.539$, $P = 0.111$; $\beta = 0.543$; Cox & Snell $R^2 = 0.062$
YDP	0.557 ± 0.968	-0.161 ± 0.912	0.017	0.763	$\chi^2(1) = 5.821$, $P =$ **0.016**; $\beta =$ **0.845***; Cox & Snell $R^2 = 0.095$
Slalom dribble					
FDP	-0.243 ± 0.928	0.146 ± 0.990	0.225	0.405	$\chi^2(1) = 1.577$, $P = 0.209$; $\beta = -0.441$; Cox & Snell $R^2 = 0.039$
YDP	-0.547 ± 0.757	0.158 ± 0.967	0.019	0.811	$\chi^2(1) = 6.036$, $P =$ **0.014**; $\beta = -0.918$*; Cox & Snell $R^2 = 0.099$
Shooting accuracy					
FDP	0.386 ± 0.773	-0.232 ± 1.022	0.051	0.682	$\chi^2(1) = 3.978$, $P = 0.046$; $\beta = 0.710$; Cox & Snell $R^2 = 0.095$
YDP	0.416 ± 0.701	-0.120 ± 1.002	0.037	0.620	$\chi^2(1) = 3.385$, $P = 0.066$; $\beta = 0.657$; Cox & Snell $R^2 = 0.057$
Lob pass					
FDP	0.773 ± 0.794	-0.464 ± 0.760	**< 0.001**	1.592	$\chi^2(1) = 17.528$, $P <$ **0.001**; $\beta =$ **1.774****; Cox & Snell $R^2 = 0.385$
YDP	0.530 ± 1.194	-0.153 ± 0.842	0.072	0.661	$\chi^2(1) = 5.285$, $P =$ **0.022**; $\beta =$ **0.797***; Cox & Snell $R^2 = 0.087$
Reliability in possession					
FDP	0.387 ± 1.103	-0.232 ± 0.826	0.050	0.635	$\chi^2(1) = 4.185$, $P =$ **0.041**; $\beta = 0.767$; Cox & Snell $R^2 = 0.099$
YDP	0.454 ± 1.031	-0.131 ± 0.914	0.053	0.600	$\chi^2(1) = 3.988$, $P =$ **0.046**; $\beta = 0.708$; Cox & Snell $R^2 = 0.066$
Pass completion					
FDP	0.601 ± 0.860	-0.360 ± 0.866	**0.002**	1.114	$\chi^2(1) = 10.347$, $P =$ **0.001**; $\beta =$ **1.297****; Cox & Snell $R^2 = 0.228$
YDP	0.160 ± 1.068	-0.046 ± 0.940	0.501	0.205	$\chi^2(1) = 0.495$, $P = 0.482$; $\beta = 0.244$; Cox & Snell $R^2 = 0.008$
Dribble completion					

FDP	0.155 ± 0.835	-0.131 ± 0.914	0.443	0.327	χ^2(1) = 0.627, P = 0.429; β = 0.271; Cox & Snell R^2 = 0.016
YDP	0.580 ± 0.661	-0.168 ± 0.978	0.012	0.896	χ^2(1) = 7.420, P = **0.006**; β = **1.136***; Cox & Snell R^2 = 0.120
Total touches					
FDP	0.206 ± 1.041	-0.123 ± 0.931	0.307	0.333	χ^2(1) = 1.095, P = 0.295; β = 0.357; Cox & Snell R^2 = 0.027
YDP	0.802 ± 0.854	-0.232 ± 0.872	< **0.001**	1.198	χ^2(1) = 11.896, P = **0.001**; β = **1.223****; Cox & Snell R^2 = 0.185
PCE 'pre'					
FDP	0.559 ± 0.927	-0.335 ± 0.853	**0.004**	1.004	χ^2(1) = 8.841, P = **0.003**; β = **1.157***; Cox & Snell R^2 = 0.198
YDP	0.015 ± 1.029	-0.004 ± 0.957	0.949	0.019	χ^2(1) = 0.004, P = 0.947; β = 0.022; Cox & Snell R^2 = 0.001
PCE 'at'					
FDP	-0.101 ± 1.049	0.061 ± 0.943	0.616	0.162	χ^2(1) = 0.267, P = 0.605; β = -0.176; Cox & Snell R^2 = 0.007
YDP	0.239 ± 1.028	-0.069 ± 0.946	0.345	0.312	χ^2(1) = 1.090, P = 0.297; β = 0.358; Cox & Snell R^2 = 0.019

*=P < 0.05, **=P < 0.01, ***=P < 0.001.

Table 2. *Physical* variable descriptive statistics, independent *t*-test results, and univariate regression models.

Variable	Playing-up *z*-score	Non-playing-up *z*-score	*P*	*d*	Univariate regression
Percentage of estimated adult height					
FDP	0.143 ± 0.903	-0.085 ± 1.022	0.466	0.236	χ^2(1) = 0.536, P = 0.464; β = 0.252; Cox & Snell R^2 = 0.01
YDP	0.700 ± 0.579	-0.207 ± 0.961	**0.002**	1.143	χ^2(1) = 11.894, P < **0.001**; β = **1.606****; Cox & Snell R^2 = 0.1
0–10 m sprint					
FDP	-0.245 ± 1.143	0.147 ± 0.848	0.222	0.390	χ^2(1) = 1.579, P = 0.209; β = -0.435; Cox & Snell R^2 = 0.03
YDP	-0.601 ± 0.744	0.174 ± 0.957	**0.009**	0.904	χ^2(1) = 7.501, P = **0.006**; β = **-1.069*;** Cox & Snell R^2 = 0.1
0–30 m sprint					
FDP	-0.380 ± 0.845	0.223 ± 0.990	0.054	0.655	χ^2(1) = 3.988, P = **0.046**; β =-0.737; Cox & Snell R^2 = 0.09

YDP	-0.786 ± 0.697	0.227 ± 0.915	**0.001**	1.245	$\chi^2(1) = 13.194$, $P <$ **0.001**; $\beta =$ **-1.501****; Cox & Snell $R^2 = 0.$
CMJ height					
FDP	-0.039 ± 1.128	0.023 ± 0.893	0.847	0.061	$\chi^2(1) = 0.039$, $P = 0.843$; $\beta = -0.067$; Cox & Snell $R^2 = 0.00$
YDP	0.654 ± 0.919	-0.189 ± 0.901	**0.005**	0.926	$\chi^2(1) = 7.843$, $P =$ **0.005**; $\beta =$ **0.966**;** Cox & Snell $R^2 = 0.1$
L-agility					
FDP	-0.324 ± 1.092	0.194 ± 0.861	0.104	0.527	$\chi^2(1) = 2.793$, $P = 0.590$; $\beta = 0.067$; Cox & Snell $R^2 = 0.09$
YDP	-0.284 ± 1.126	0.082 ± 0.910	0.231	0.358	$\chi^2(1) = 1.519$, $P = 0.419$; $\beta = 0.067$; Cox & Snell $R^2 = 0.03$

*=$P < 0.05$, **=$P < 0.01$, ***=$P < 0.001$.

Table 3. *Psychological* variable descriptive statistics, independent *t*-test results, and univariate regression models.

Variable	Playing-up *z*-score	Non-playing-up *z*-score	*P*	*d*	Univariate regression
Factor 1					
FDP	0.144 ± 0.580	-0.086 ± 1.151	0.477	0.252	$\chi^2(1) = 0.542$, $P = 0.462$; $\beta = 0.254$; Cox & Snell $R^2 = 0.$
YDP	-0.238 ± 0.827	0.069 ± 0.998	0.318	0.335	$\chi^2(1) = 1.041$, $P = 0.308$; $\beta = -0.340$; Cox & Snell $R^2 = 0.$
Factor 2					
FDP	0.085 ± 0.774	-0.051 ± 1.089	0.675	0.144	$\chi^2(1) = 0.187$, $P = 0.665$; $\beta = 0.147$; Cox & Snell $R^2 = 0.$
YDP	-0.049 ± 0.946	0.014 ± 0.979	0.838	0.065	$\chi^2(1) = 0.044$, $P = 0.834$; $\beta = -0.069$; Cox & Snell $R^2 = 0.$
Factor 3					
FDP	0.026 ± 0.903	-0.016 ± 1.032	0.896	0.043	$\chi^2(1) = 0.018$, $P = 0.893$; $\beta = 0.046$; Cox & Snell $R^2 < 0.$
YDP	0.379 ± 0.809	-0.110 ± 0.986	0.108	0.542	$\chi^2(1) = 2.822$, $P = 0.093$; $\beta = 0.601$; Cox & Snell $R^2 = 0.$
Factor 4					
FDP	0.213 ± 0.821	-0.128 ± 1.05	0.290	0.362	$\chi^2(1) = 1.191$, $P = 0.275$; $\beta = 0.378$; Cox & Snell $R^2 = 0.$
YDP	0.163 ± 0.981	-0.047 ± 0.965	0.503	0.216	$\chi^2(1) = 0.496$, $P = 0.481$; $\beta = 0.237$; Cox & Snell $R^2 = 0.$
Factor 5					
FDP	-0.09 ± 1.075	0.054 ± 0.927	0.658	0.143	$\chi^2(1) = 0.209$, $P = 0.648$; $\beta = -0.155$; Cox & Snell $R^2 = 0.$
YDP	-0.212 ± 1.113	0.061 ± 0.922	0.372	0.267	$\chi^2(1) = 0.807$, $P = 0.369$; $\beta = -0.290$; Cox & Snell $R^2 = 0.$
Factor 6					
FDP	0.255 ± 0.638	-0.153 ± 1.113	0.204	0.450	$\chi^2(1) = 1.806$, $P = 0.179$; $\beta = 0.497$; Cox & Snell $R^2 = 0.$
YDP	-0.501 ± 0.939	0.145 ± 0.932	0.032	0.691	$\chi^2(1) = 4.765$, $P =$ **0.029**; $\beta =$ **-0.761***; Cox & Snell $R^2 = 0$

*=*P* < 0.05, **=*P* < 0.01, ***=*P* < 0.001.

Table 4. *Social* variable descriptive statistics, independent *t*-test results, and univariate regression models.

Variable	Playing-up *z*-score	Non-playing-up *z*-score	*P*	*d*	Univariate regression
Age started playing academy football					
FDP	-0.429 ± 1.104	0.257 ± 0.804	0.047	0.710	$\chi^2(1) = 4.813$, P = **0.028**; $\beta = -0.772$; Cox & Snell $R^2 = 0.113$
YDP	-0.475 ± 0.977	0.137 ± 0.926	0.043	0.624	$\chi^2(1) = 4.584$, P = **0.032**; $\beta = -0.801$; Cox & Snell $R^2 = 0.076$
Total coach-led practice hours					
FDP	0.329 ± 1.052	-0.198 ± 0.887	0.098	0.542	$\chi^2(1) = 2.908$, $P = 0.088$; $\beta = 0.609$; Cox & Snell $R^2 = 0.096$
YDP	0.661 ± 0.914	-0.191 ± 0.900	**0.004**	0.939	$\chi^2(1) = 8.635$, P = **0.003**; β = **1.089****; Cox & Snell $R^2 = 0.211$
Total peer-led play hours					
FDP	0.083 ± 1.068	-0.496 ± 0.932	0.683	0.578	$\chi^2(1) = 0.177$, $P = 0.674$; $\beta = 0.142$; Cox & Snell $R^2 = 0.006$
YDP	-0.477 ± 0.844	0.138 ± 0.961	0.042	0.680	$\chi^2(1) = 4.657$, P = **0.031**; $\beta = -0.818$; Cox & Snell $R^2 = 0.118$
Total football hours					
FDP	0.524 ± 1.113	-0.314 ± 0.738	0.225	0.887	$\chi^2(1) = 1.567$, $P = 0.211$; $\beta = 0.436$; Cox & Snell $R^2 = 0.038$
YDP	-0.139 ± 0.766	0.040 ± 1.018	0.560	0.199	$\chi^2(1) = 0.356$, $P = 0.551$; $\beta = -0.197$; Cox & Snell $R^2 = 0.006$
Total multisport hours					
FDP	0.480 ± 1.305	-0.288 ± 0.565	0.014	0.764	$\chi^2(1) = 6.230$, P = **0.013**; β = **0.957***; Cox & Snell $R^2 = 0.197$
YDP	0.128 ± 0.735	-0.037 ± 1.025	0.590	0.185	$\chi^2(1) = 0.295$, $P = 0.587$; $\beta = 0.175$; Cox & Snell $R^2 = 0.008$
Total football and multisport hours					
FDP	0.243 ± 1.043	-0.086 ± 1.151	**0.007**	0.300	$\chi^2(1) = 7.892$, P = **0.005**; β = **1.147***; Cox & Snell $R^2 = 0.179$

YDP	-0.93 ± 0.855	0.028 ± 1.000	0.698	1.030	$\chi^2(1) = 0.160$, $P = 0.689$; $\beta = -0.134$; Cox & Snell $R^2 = 0.003$

*=$P < 0.05$, **=$P < 0.01$, ***=$P < 0.001$.

Table 5. Multivariate logistic regression across the four corners.

Age phase	Predictor	β	SE	Wald's χ^2	OR	Cox & Snell R^2
FDP	*Lob pass*	4.259	1.754	$\chi2(1) = 5.897$, $P = 0.015$	70.774	0.618
	Pass completion	2.064	1.223	$\chi2(1) = 2.847$, $P = 0.092$	7.877	
	PCE 'pre'	2.644	1.285	$\chi2(1) = 4.236$, $P = 0.040$	14.068	
	Age started playing academy football	-1.982	1.150	$\chi2(1) = 2.969$, $P = 0.085$	0.138	
	Constant	-2.527	1.413	$\chi2(1) = 3.196$, $P = 0.074$	0.080	
YDP	*Ball juggle*	1.579	0.769	$\chi2(1) = 4.210$, $P = 0.040$	4.849	0.495
	0–10 m sprint	-1.749	0.837	$\chi2(1) = 4.370$, $P = 0.037$	0.174	
	Factor 3	2.957	1.193	$\chi2(1) = 6.147$, $P = 0.013$	19.231	
	Factor 6	-3.265	1.239	$\chi2(1) = 6.941$, $P = 0.008$	0.038	
	Total coach-led practice hours	2.351	0.961	$\chi2(1) = 5.983$, $P = 0.014$	10.501	
	Constant	-3.435	1.093	$\chi2(1) = 9.882$, $P = 0.002$	0.032	